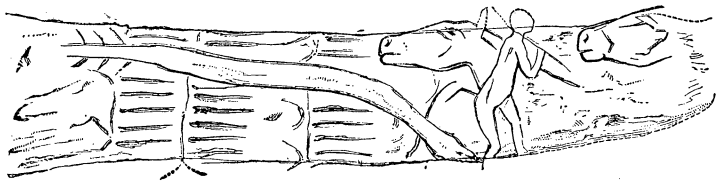

FIG. 5.—Figure of a naked man between two horses heads.

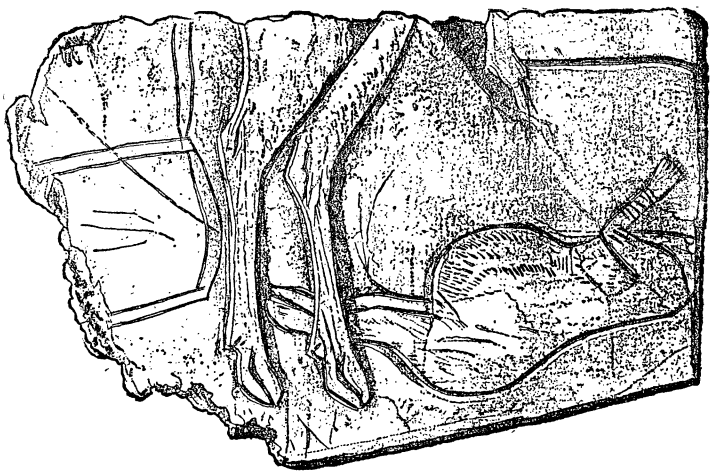

FIG. 6.—Fragment of a scapula, found at Laugerie Basse, on which is engraved the figure of a pregnant woman.

the antiquity of man nor as to his origin, which he acknowledges to be as yet wrapped in obscurity, and he is candid and generally critical in his views, but not always inclined to sift his authorities, hence while the book is very readable it is not always to be implicitly trusted.

SECOND GEOLOGICAL SURVEY OF THE ANTHRACITE COALFIELDS OF PENNSYLVANIA.—The survey of these fields was commenced in August, 1880, under the direction of Mr. Charles A. Ashburner, geologist in charge, and the first results of the work done, published by the State, have just appeared in the Panther Creek Atlas, which contains eleven sheets, twenty-six by thirty-two inches, relating to the geology of the extreme eastern end of the Southern (Schuylkill) coalfield, lying between Mauch Chunk, in Carbon county, and Tamaqua, Schuylkill county, as follows: Three mine sheets, showing the horizontal plan of the mines, and the geological structure of the coal beds by contour curve lines, fifty feet vertically apart, drawn in the floor of the Mammoth bed, scale 800 ft. = 1 in.; three cross-section sheets, showing the vertical structure of the coal beds, scale 400 ft. = 1 in.; three columnar section sheets, showing the thickness of the coal

beds with their included slate and bony layers, and the thickness and character of the rocks between the respective beds, drawn on the following scales: coal-bed sections 10 ft. = 1 in., coal-measure sections 40 ft. = 1 in., conglomerate (mill-stone grit) sections 100 ft. = 1 in.; one topographical sheet, showing the surface features of the same area covered by the mine sheets, scale 1600 ft. = 1 in.; and one sheet showing the development of the surface of the highly-flexured Mammoth bed into a horizontal plane. In addition to these sheets relating to the Panther Creek basin there is one sheet giving a general map of the entire coalfields, with a list of the working collieries, with their production in 1881, and the thickness of the coal beds and coal measures in the different districts, and also one sheet showing the annual production of the region since 1820 to 1881 inclusive.

Mr. Ashburner's report of progress descriptive of these sheets is now going through the press; his more technical discussion of the geology of the Panther Creek basin will not appear until his final report is published, after the completion of the entire survey.

The special methods which Mr. Ashburner has devised, and which have been approved by J. P. Lesley, State geologist, deserve particular notice, since they have, without doubt, applied the science of geology more directly to the art of mining than has ever before been done by any of the State surveys on the American continent. When this survey was ordered the strongest prejudice existed among the mining men in the coal basins against the possibility of the State corps accomplishing any results which would be of utility in the exploitation of the coal beds. Without the support and coöperation of the mining companies, by which the facts in their possession could be obtained, it would have been useless to have attempted any work. This information was secured by adopting a plan of work which sought to clearly indicate the precise position of each coal bed and the amount of workable coal contained. The practical questions to be answered were: How much coal is there? Where is it? At what depth? With how steep a dip? In what direction? With what basins, and saddles of what length, breadth, depth, and height? In what direction would level drifts run? Where would the coal be best attacked by shafts or drifts? What beds of rock or coal lie above or below the coal worked, and what distance? What is the situation of the coal with reference to water courses or other features on the surface of the ground? and the like. It is easily conceivable that it would be impossible to give indications of that kind so fully and satisfactorily with a whole volume of words as with properly constructed maps and sections on scales large enough for reliable measurements to be taken directly from them. As far as the Panther Creek basin is concerned, which is about one-fortieth

the area of the entire field, these questions are all answered as far as it is *possible* by the facts contained on the present atlas sheets. A noticeable feature of the method of illustration is that all facts which are very numerous are boldly separated from the hypothetical deductions, so that Mr. Ashburner and his assistants give every one the means of verifying, modifying, or disproving their conclusions. This renders the work of more prominent and practical value than much of the geological mapping which is published, and in addition inspires the confidence of practical men.

The plan of representing geological structure of sedimentary strata by underground contours, although not novel in itself, since it has been employed extensively by Lesley in America in private surveys, and Lyman in Japan in government surveys, yet Ashburner deserves the credit of perfecting the method and of practically applying it to the exhibition of the complicated structure of the anthracite coal beds, which have every conceivable angle of dip from 0° of a horizontal position to 35° overturned from a vertical position. With all this bold flexuring not a single break or fault in the strata of the Panther Creek basin is shown in any of the cross-sections, although the mine sheets show several of inconsiderable extent, being all, however, under ten feet. This is a remarkable fact when one recalls the numerous faults found in the comparatively horizontal and undisturbed coal beds of the Yorkshire field, England; maps and sections of which are before us. This difference in the faulting has never been satisfactorily explained by dynamical geologists. We understand that Ashburner is disposed to believe that the plication of the anthracite coal strata took place when they were in a semi-plastic condition, that is before they were thoroughly dried out and hardened. Faults in the bituminous measures of the Appalachian belt have been found of greater extent than the small faults referred to in the Panther Creek basin, for this and other reasons it is probable that the main structural features of the anthracite basins were determined anterior to those of the nearly horizontal bituminous basins back of the escarpment of the Allegheny mountains. The *time* of flexuring may have something to do with the origin of the anthracite, which Ashburner believes must be explained on chemical rather than on geotectonic grounds. Certain it is that no satisfactory explanation has ever been offered for the presence of anthracite instead of bituminous coal in Northeastern Pennsylvania. Anthracite cannot be in any way the *direct* product of forces which produced plications. The Belgian coals contain forty-five per cent of volatile matters, and are even more highly flexured than the Pennsylvania anthracites. The trap dyke theory, so popular with foreign geologists, and not long since strongly advocated by Mr. Edward Hardman,[1] has long

[1] Journal Royal Geological Society of Ireland, Vol. IV, part 3 (New Series).

been exploded by our geologists as accounting for our Pennsylvania anthracites, for there are no trap dyke exhibitions within many miles of the anthracite basins. We shall await with some impatience any explanations which Ashburner will be able to prove with the facts which he is gathering.

A most remarkable thickness of coal is observed in one of the sections of the Mammoth bed measured in the vicinity of the "Old Lehigh Summit Hill mine (quarry)." The thickness perpendicular to its bedding is 114 feet, with 106 feet of workable coal, yet 91 feet away the bed measures only 73 feet thick with but 66 feet of coal. As great a change is observed in the thickness of the coal measure, sandstones and conglomerates (Pottsville conglomerate No. XII, or Millstone grit), from the bottom of the Mammoth bed down to the top of the Mauch Chunk red shale, No. XI (representative of the Mountain, St. Louis, Chester, and Lewisburg, Va., limestones). At Tamaqua these strata measure 1700 feet thick, at Lansford, only five miles to the east, they only measure 900 feet thick, while at the old Hacklebarney tunnel, back of Mauch Chunk, eleven and a half miles east of Tamaqua, and six and a half miles east of Lansford, they have thickened again to 1550 feet. This is a fact quite inconsistent with all previous views which have been held in regard to the structure of the carboniferous conglomerate in the anthracite region. Ashburner offers no explanation other than in a note placed on the sheet which says that it "may show a non-conformability between the conglomerate and the underlying Mauch Chunk red shale No. XI, * * * or a non-conformability between the individual strata forming the conglomerate measures." We understand that the facts developed by these sections with others not yet published lead to the conclusion that during the carboniferous epoch there was a continual subsidence going on in this section rather than successive subsidences and elevations as is generally believed.

The sheet showing the development of the surface of the Mammoth bed gives some interesting facts relating to the ratio of the surface underlaid by the beds, and the actual surface area of the beds. The Mammoth bed, in the Panther Creek basin, underlies 10,708 square miles of surface, whereas the area of the bed is 16,990 square miles. This sheet is the basis of estimates of the amount of coal originally contained (1,032,000,000 tons), in the area which has been exploited (92,189,000 tons), and of the amount which has been actually removed from this area (54,116,000 tons).

COUES-STEARNS' NEW ENGLAND BIRD LIFE.[1]—With the completion of the second volume of this work, the incipient or the

[1] *New England Bird Life.* Being a manual of New England Ornithology. Revised and edited from the manuscript of WINFRED A. STEARNS by ELLIOTT COUES. Part II. Non-oscine Passeres, birds of prey, game and water Birds. Boston, Lee & Shepard; New York, Charles T. Dillingham. 1883. 12mo, pp. 409.